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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/902,490	07/11/2001	Antonius Johannes Josephus Van Dijsseldonk	P 281525 P-0196.010-US	5928

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EXAMINER

CHOI, WILLIAM C

ART UNIT PAPER NUMBER

2873

DATE MAILED: 07/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,490

Applicant(s)

VAN DIJSSELDONK ET AL.

Examiner

William C. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,4-9,12-17,19,20 and 23-25 is/are rejected.
- 7) ☒ Claim(s) 2,3,10,11,18,21,22 and 26 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

Receipt of the Information Disclosure Statement (IDS) with the copies of the references cited therein was received on 7/11/2001. An initialized copy of the IDS is enclosed with this office action.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: "M1", "M2", "PM", "PW", "BP", "P1" and "P2". A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4-9, 12-17, 19 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald et al (U.S. 5,142,132) in view of Rawlings (U.S. 4,196,972).

In regards to claim 1, MacDonald et al discloses a lithographic projection apparatus (column 1, lines 21-25 and column 4, lines 10-11, Figure 1) comprising: a radiation system to provide a projection beam of radiation (column 4, line 11, Figure 1, "2"); a support structure to support patterning structure adapted to pattern the projection beam according to a desired pattern (column 4, lines 15-17, Figure 1, "20"); a substrate table to hold a substrate (column 5, lines 27-30, Figure 1, "24"); a projection system to project the patterned beam onto a target portion of the substrate (column 4, lines 10-13, Figure 1, "4", "6", "8", "10"); and an active reflector (column 4, lines 11-12, Figure 1, "6") comprising a body member (column 4, lines 52-53, Figure 2, "32"), a reflective multilayer (column 4, lines 53-59, Figure 2, "34"), and at least one actuator controllable to adjust a surface figure of said reflective multilayer (column 4, lines 60-64, Figure 2, "36") and comprises an element of the projection system (Figure 1, "6"), but does not specifically disclose wherein said actuator is operable to exert a force having a component in a direction parallel to the surface figure of said reflective multilayer. Within the field of deformable reflective elements in optical systems (column 1, lines 11-12), Rawlings teaches that it is desirable to have actuators operable to exert a force having a component in a direction parallel to the surface of a reflective layer for the

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purpose of avoiding transmission of reaction forces normally attributed to forces acting normal to the surfaces (column 1, lines 17-22 and column 3, lines 63-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the actuator of MacDonald et al to be operable to exert a force having a component in a direction parallel to the surface figure of said reflective multilayer since Rawlings teaches that it is desirable to have actuators operable to exert a force having a component in a direction parallel to the surface or a reflective layer for the purpose of avoiding transmission of reaction forces normally attributed to forces acting normal to the surfaces.

Regarding claim 4, Rawlings further teaches wherein said actuator is operable to apply force to said active reflector substantially only in directions parallel to the plane of said reflecting multilayer (column 5, lines 1-6, Figure 4, "76").

Regarding claim 5, Rawlings teaches wherein said actuator is operative to apply a torque to said active reflector (column 5, lines 1-6, re "couples").

Regarding claim 6, Rawlings teaches wherein said actuator is operative to apply torques about a point in or near said reflective multilayer (Figure 4, "44" and "48").

Regarding claim 7, Rawlings teaches wherein said active reflector comprises at least one projection (Figure 4, "46") at a back side opposing said reflective multilayer and said actuator (Figure 4, "76") is mechanically linked to said projection so as to apply said torques on said active reflector (Figure 4, "52" and "80").

Regarding claim 8, Rawlings teaches wherein said actuator (Figure 4, "76") is mechanically linked to said active reflector in between two projections (Figure 4, "46").

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Regarding claim 9, MacDonald et al discloses wherein said actuator comprises a piezoelectric actuator (column 4, lines 61-64).

Regarding claims 12 and 13, MacDonald et al discloses wherein said active reflector comprises a plurality of projections arranged in a regular array (column 5, lines 1-7, Figure 3).

Regarding claim 14, MacDonald et al discloses wherein said lithographic projection apparatus further comprises a sensor to detect aberrations in a radiation beam reflected by said active reflector (column 5, lines 41-45, Figure 1, "14") and a control system responsive to said sensor to control said actuator to minimize said aberrations (column 5, lines 45-58, Figure 1, "16").

Regarding claim 15, MacDonald et al discloses wherein said sensor comprises an interferometer to measure the surface figure of said active reflector (column 5, lines 33-63, Figure 1, "12").

Regarding claim 16, MacDonald et al discloses wherein said sensing means comprises an interferometer functional at a wavelength of said projection beam of radiation (column 5, lines 33-36).

Regarding claim 17, MacDonald et al discloses wherein said sensor comprises a wavefront sensor to measure the surface figure of said active reflector (column 5, lines 33-41).

Regarding claim 19, MacDonald et al discloses wherein said optical system includes a plurality of active reflectors (column 5, lines 1-7, Figure 3), said control

system is operable to control said plurality of active reflectors together to minimize wavefront aberrations in said optical system as a whole (column 5, lines 46-63).

Regarding claim 23, MacDonald et al discloses wherein the support structure comprises a mask table to hold a mask (column 4, lines 15-17, Figure 1, "20", re "reticle").

Regarding claim 24, MacDonald et al discloses wherein the radiation system comprises a radiation source (column 4, lines 19-26, Figure 1, "2").

In regards to claim 25, MacDonald et al discloses a device manufacturing method comprising: projecting a patterned beam of radiation onto a target portion of a layer of radiation-sensitive material on a substrate (column 5, lines 27-30); and controlling an active reflector to minimize wavefront aberration in the patterned beam of radiation (column 5, lines 46-63), wherein said active reflector comprises a body member (column 4, lines 52-53, Figure 2, "32"), a reflective multilayer (column 4, lines 53-59, Figure 2, "34") and at least one actuator controllable to adjust a surface figure of said reflecting multilayer (column 4, lines 60-64, Figure 2, "36") and wherein said active reflector comprises an element of a projection system to project the patterned beam of radiation (Figure 1, "6"), but does not specifically disclose wherein said actuator exerts a force having a component in a direction parallel to a surface figure of the reflective multilayer. Within the field of deformable reflective elements in optical systems (column 1, lines 11-12), Rawlings teaches that it is desirable to have actuators operable to exert a force having a component in a direction parallel to the surface of a reflective layer for the purpose of avoiding transmission of reaction forces normally attributed to forces

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acting normal to the surfaces (column 1, lines 17-22 and column 3, lines 63-67, Figure 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the actuator of MacDonald et al to be operable to exert a force having a component in a direction parallel to the surface figure of said reflective multilayer since Rawlings teaches that it is desirable to have actuators operable to exert a force having a component in a direction parallel to the surface of a reflective layer for the purpose of avoiding transmission of reaction forces normally attributed to forces acting normal to the surfaces.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacDonald et al in view of Rawlings and further in view of Chapman et al (U.S. 5,986,795).

Regarding claim 20, MacDonald et al in view of Rawlings discloses as set forth in claim 1, but does not specifically disclose wherein said projection beam comprises extreme ultraviolet radiation having a wavelength of less than 50 nm. Within the same field of endeavor, Chapman et al teaches that it is desirable to use short wavelengths (<20 nm) in photolithography in order to provide a smaller resolution dimension allowing for more devices to be fabricated on a given area of a wafer (column 1, lines 23-32).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the projection beam of MacDonald et al in view of Rawlings, to comprise extreme ultraviolet radiation having a wavelength of less than 50 nm since Chapman et al teaches that it is desirable to use short wavelengths (<20 nm)

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in photolithography in order to provide a smaller resolution dimension allowing for more devices to be fabricated on a given area of a wafer.

Allowable Subject Matter

Claims 2, 3, 10, 11, 18, 21, 22 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claims 2 and 3: a lithographic projection apparatus as claimed, specifically wherein said actuator is operable to apply force to said active reflector such that a force component in a direction perpendicular to the plane of said reflecting multilayer is less than 50% of a total force exerted by said actuator.

The prior art fails to teach a combination of all the claimed features as presented in claim 10: a lithographic projection apparatus as claimed, specifically wherein said actuator comprises one of a pneumatic and a hydraulic actuator.

The prior art fails to teach a combination of all the claimed features as presented in claim 11: a lithographic projection apparatus as claimed, specifically comprising at least two projections and wherein said projections further define walls of a cavity adapted to contain a fluid to exert one of a pneumatic and a hydraulic force on said

The prior art fails to teach a combination of all the claimed features as presented in claim 18: a lithographic projection apparatus as claimed, specifically wherein said sensor comprises at least one strain gauge to detect a strain in said reflective multiplayer of said active reflector.

The prior art fails to teach a combination of all the claimed features as presented in claims 21, 22 and 26: a lithographic projection apparatus as claimed, specifically wherein said extreme ultraviolet radiation has a wavelength between about 8 nm and about 20 nm.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (703) 305-3100. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

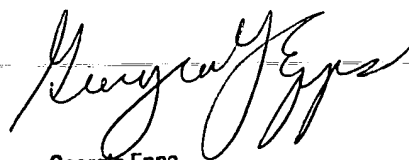
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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W.C.

William Choi
Patent Examiner
Art Unit 2873
July 7, 2003

A handwritten signature in black ink, appearing to read "Georgia Epps", written in a cursive style.

Georgia Epps
Supervisory Patent Examiner
Technology Center 2800